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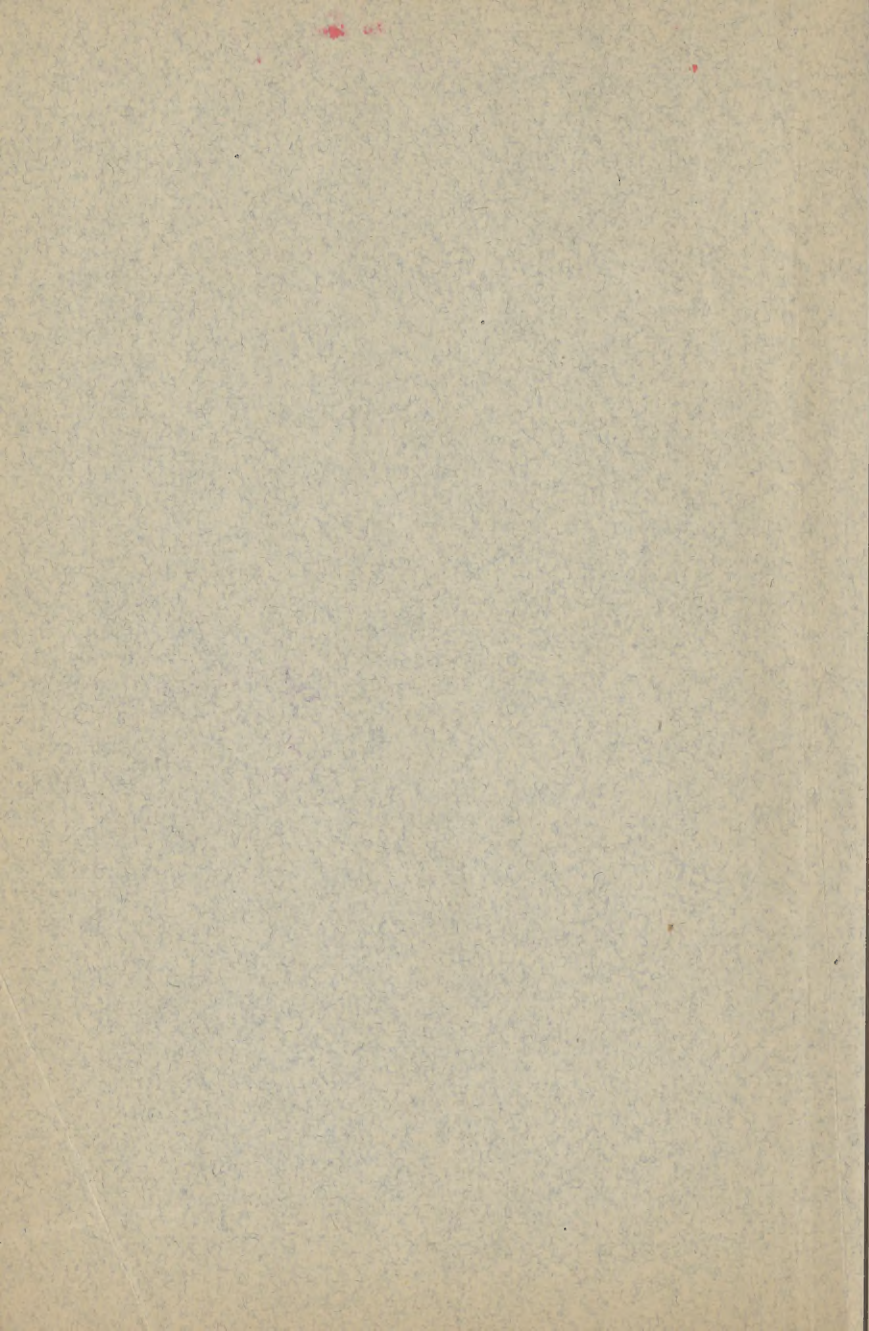
THE  
SLOW PULSE AND DISTURBANCES  
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RHYTHM OF THE PULSE.

BY  
T. A. MCBRIDE, M.D.,  
NEW YORK.



*Reprinted from THE MEDICAL RECORD, November 12, 1881*

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## THE SLOW PULSE AND DISTURBANCES IN THE RHYTHM OF THE PULSE.\*

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A PULSE of 60 or less is usually pathological. Occasionally we meet with cases in which the pulse-beat in health is habitually below 60, but such examples are infrequent.

The following schema, taken from Dr. T. Lauder Brunton's book on the "Experimental Investigations of the Action of Medicines, Part I. Circulation," London, 1875, exhibits the causes of slow action of the heart as determined by experiment on animals, and if you will keep this before you, you will find that it will assist you in the explanation of many cases in which a slow pulse is observed :

A. Irritation of vagus roots : 1. Directly by the action of an excitant, drug, or pain. 2. Indirectly by increased blood-pressure. 3. Indirectly by increased CO<sub>2</sub> in blood. 4. Reflexly by irritation of some other nerve.

B. Irritation of vagus ends in the heart.

C. Increased excitability of vagus ends in the heart.

D. Weakness of the heart : 1. Paralysis of cardiac ganglia. 2. Paralysis of muscular fibres of the heart. 3. Degeneration of muscular fibres of the heart.

A slow pulse is a prominent or important symptom in the following pathological conditions :

1. *Fevers*.—In typhus, although the pulse, as a rule, ranges from 100 to 120, a slow pulse is not infrequently observed. Murchison reports cases in

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\* A lecture delivered at the last Spring Course of the College of Physicians and Surgeons, New York.

which the pulse was 28 to 40.\* In such cases there is usually very great prostration, and the heart may be seriously affected by pathological changes which are common in this disease. In convalescence a slow pulse is very often present. It is well to bear in mind that in adynamic conditions the pulse-beat does not always correspond to every ventricular contraction. Often a pulse-beat at the wrist occurs only after two or three contractions of the ventricle have taken place.

In relapsing fever, although the frequency of the pulse is very great in the pyretic periods, yet in the intervals it is much diminished in rate.

"In the first half of the apyretic stage, however, the pulse usually continues a little above the normal standard, but for some days before the relapse, when the temperature has regained its normal height, the pulse is in many cases irregularly slow—often not exceeding 40 to 50; but assuming the erect position will sometimes raise it from 50 to upward of 100. The slow pulse is not due to slowness in the contraction of the heart, but to a prolongation of the pause."†

2. *Diseases of heart and lungs.*—In attacks of syncope the pulse may fall to 20, and even lower, and continue at this rate for some minutes. In the early stages of endo- and pericarditis a pulse of diminished frequency is sometimes observed. In most congenital affections of the heart, and particularly in the *morbis cæruleus*, a slow pulse is present. In fatty degeneration of the heart and in stenosis of the aortic orifice, the diminution in the rate of pulse becomes a sign of some importance in diagnosis and prognosis. In aortic stenosis the pulse is seldom lower than 50, and is small and incompressible. In fatty degeneration or Quain's disease it may fall as low as 30, or even 20, and a pulse of 10, with continuance of life has been observed. The pulse is small, gaseous, easily compressible. A slow pulse,

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\* A Treatise on the Continued Fevers of Great Britain, by Charles Murchison, M.D. London, 1875.

† Murchison: Loc. cit.

with epileptiform seizures, has also been observed in cases in which fibrinous masses were found affixed to the walls of the ventricular cavity after death (Ogle: "Transactions Pathological Society of London for 1863," p. 89). Permanent slow pulse has likewise been observed to follow attacks of diphtheria, and the explanation offered for this has been the frequent occurrence of fibrinous masses in the heart, which become attached to the walls of the heart. Charcot, however, has suggested that in such cases some lesion of the medulla or cervical cord may be present.

In pleurisy, with abundant effusion, after the crisis of croupous pneumonia, in the early stages of gangrene of the lung, a slow pulse is often encountered. In all diseases of the air-passages, or of the lungs in which carbonic acid poisoning occurs, the pulse at first is slow, by reason of irritation of the vagus roots by this poison, but later the pulse becomes very much increased in frequency, from paralysis of the vagus roots by the increase of the poison in the blood. In pulmonary tuberculosis a rather frequent pulse is the rule, but sometimes the pulse diminishes in frequency, and Traube\* states that this is a sign of bad import.

3. *Affections of the nervous system.*—In the first stages of cerebral hemorrhage and cerebral compression a slow pulse is of frequent occurrence, and may also be present throughout the attack, but usually, and especially when death is imminent, the rapid pulse succeeds.

In what is usually termed the second stage of almost all of the varieties of meningitis, the pulse is apt to be slow. Niemeyer† and Traube assert that if in the course of any disease with head-symptoms, the pulse should suddenly fall from a high rate, as 110 or 120 to 50, 60, or 70, suspicion should at once be directed strongly to the occurrence of a meningitis. The diminished frequency is most marked in

\* L. Traube: Die Symptome der Krankheiten des Respirations- und Circulations-Apparats. Berlin, 1867.

† Niemeyer's Text-Book of Practical Medicine, vol. ii., p. 237. New York, 1880.

basal, and especially in basilar meningitis, in which latter affection it may be 40, or less. In fractures of the cervical vertebræ, a slow pulse is common. Mr. Hutchinson\* reports a case of fracture of the fifth and sixth cervical vertebræ, in which a regular pulse of 48 was observed. According to Gurlt,† the pulse may fall as low as 36, and even to 20. Fractures of the first dorsal vertebra seem to be accompanied for a time also by this slowness of the pulse. The rule is for this slow action of the heart to be transitory, and to be replaced by a very great increase in the frequency, and this occurrence has usually a bad significance. The slow pulse may, however, continue for some time. In a case of Rosenthal's the pulse oscillated between 48 and 56 for four weeks, and the patient, a child, aged fifteen, recovered. In certain cases of irritation of the cervical spinal cord by neoplasm, tumors, pachymeningitis, etc., a slow pulse has often been noted. Charcot‡ has observed three cases. In one the pulse was from 20 to 30. In such cases syncopal apoplectiform and epileptiform attacks frequently occur, and in the attacks the pulse may fall to 15 or 20. He also refers to a case in which there was a decided narrowing of the vertebral canal near the occipital foramen, in which a slow pulse was observed. In melancholia a slow and feeble pulse is common. Spring§ records a case with a pulse of 15. In migraine and hemicrania the pulse rate is low during attacks, as a rule. Lieving|| quotes Wollendorf as follows: "From the beginning and during the continuation of hemicrania the rate of cardiac pulsations is considerably lowered, the normal pulse-rate of from 72 to 76 to the minute, sinking to from 56 to 48

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\* Mr. Hutchinson's London Hospital Reports, vol. iii., p. 266, 1866.

† E. Gurlt: Handbuch der Lehre von den Knochenbrüchen, p. 62, 1864.

‡ Lectures on Diseases of the Nervous System by G. M. Charcot, second series pp. 108-120; trans. by the New Sydenham Society. London, 1881.

§ Symptomatologie ou Traite des Accidents Morbides, par A. Spring, tom. Ier, p. 501. Paris, 1868-1872.

|| E. Lieving: On Migraine and Sick Headache. London, 1873.



beats." Lieving also records cases of gastralgia, hysterical asthma, epilepsy with gastric aura, in which, during the attacks, the pulse would fall to 50 and lower; also cases of hiccough, in which the pulse-rate was so reduced as to be synchronous with the hiccough.

4. In the period of invasion of erysipelas, diphtheria, and some of the exanthemata; in scleroma neonatorum; in convalescence from gastro-intestinal catarrh; in scurvy; gout; in certain cases of malarial affection; in jaundice; in the attacks of lead colic; in ergotism; and lastly, in some cases of uræmic poisoning in the course of Bright's disease, a pulse of 50 and less is not infrequently observed.

*Rhythm.*—The disturbances of the rhythm of the pulse are those of intermission and irregularity.

*An intermittent pulse* is one in which a pause occurs between the pulsations, which is equal to the time occupied by one or more pulsations.

The intermittent pulse may be present in perfectly healthy persons, and may have always existed. Dr. B. W. Richardson has also shown that it may be produced in a man otherwise healthy, by grief, terror, anxiety, fatigue, pain, passion, adverse fortunes, etc. When it is the only peculiarity of the pulse it is not a sign of any great importance, although it is observed often in cerebral hemorrhage, and in cerebral compression from fractures of the skull, in tumors of the brain, in gout and syphilis. It is present often in dilatation and degeneration of the heart, but is then associated usually with an irregular pulse, especially if the patient moves about. The ventricle requires the stimulus of a greater quantity of blood before it will contract, and one, two, or three contractions of the auricle may occur before there is a pulse-beat. In this way, since varying quantities of blood are thrown into the arteries, irregularity of the pulse results.

*Irregularity of the pulse* is a much more important symptom by itself than the pulse with intermissions. The following are some of the diseases or conditions in which an irregular pulse is a sign of importance:

1. *Neurosal irregularity*.—The irregularity of the pulse, which is often very great, may be provoked by peripheral irritation, as dyspepsia, meteorism, worms, etc. It often occurs in hysteria and hypochondriasis, and in anæmia. With the irregularity there is often intermission of the pulse. In this form of irregularity—the neurosal—exertion, effort, or movements of the body of any kind, have but little effect upon the disturbed rhythm of the pulse. The irregularity and intermissions are not increased, and sometimes are even diminished. Irregularity and intermissions of the pulse, however, when dependent upon valvular disease and degeneration of the structure of the heart, are much augmented by the slightest movement. The exaggerated changes in the rhythm are accompanied by dyspnoea, palpitations, and often syncope.

2. *Irregularity of pulse in heart disease*.—In most diseases of the heart the occurrence of degeneration of the muscular substance is marked by the appearance of an irregular and intermittent pulse. There is a variety of valvular disease of the heart, however, in which the irregular pulse is quite constantly present, and without any degenerative change having occurred in the walls of the heart—mitral insufficiency. The irregular pulse is frequently present in cases of mitral insufficiency for years, and the pulse is called the “mitral pulse.” Sometimes the irregularity of the pulse cannot be appreciated until the arm of the patient is elevated, and in this position the irregularity is readily noted.

3. *Syphilis*.—Fournier\* has called attention to the fact that irregularity is of frequent occurrence in the secondary period of syphilis. It may be in these cases irregular to-day and regular to-morrow. It may be irregular in the morning and regular in the evening. It may be associated with the other phenomena of secondary syphilis, or it may occur without any other symptoms of the disease being present at that time.

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\* Leçons sur la Syphilis, par A. Fournier, p. 894. Paris, 1873.

4. Dr. B. W. Richardson \* refers to two forms of irregularity of the pulse, which it is of importance to recognize: "Acute Irregularity in Time" and "Prolonged Irregularity in Time."

"Acute Irregularity in Time:" Each stroke is given in the correct order of succession, the one stroke to the other, but in series of five, ten, or other number of beats, differing in rate from other series. In cases of very feeble heart we often meet this condition; we meet it in anæmia, we meet it after loss of blood, and other states of depression.

"Prolonged Irregularity of Time:" This is a condition in which the pulse shall, during one minute, register, say 70, and if counted through a succeeding minute, 90 to 100 beats. This form of irregularity in relation of time is met with most distinctively in cases of acute cerebral diseases, especially in the hydrocephalus of children. In hydrocephalus, according to my experience, it is a fatal sign. I have never known an instance of recovery when, with other acute disease, this prolonged irregularity has been markedly present."

Our forefathers in medicine christened some of the pulses with disturbed rhythm, and I will mention the names of some of them as curiosities, although a few are worthy of remembrance.

a. *Pulsus deficiens, an intermittent pulse*.—Where one or more contractions of the heart are entirely wanting, and no pulsation can be felt in any of the arteries. *Pulsus deficiens* has also been applied to that pulse in which every beat seems as if it were the last.







b. *Pulsus intermittens*.—An intermittent pulse, but only so because some contractions of the heart are too feeble to produce a pulsation at the periphery of the wrist.

c. *Pulsus intercurrents aut incidens*.—A pulse which feels as if between two equal and regularly following

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\* Discourses on Practical Physic, by Dr. B. W. Richardson. London, 1871.

elevations a dissimilar one was interjected, or a pulse in which a superfluous pulsation seems to occur from time to time.

d. *Pulsus coturnisans*.—Two or more pulsations are compounded into forming a doubly or trebly compound pulse, as —, or ——, or ——.

e. *Pulsus caprizans*.—One which seems to leap like a goat. An imperfect dilatation of an artery being succeeded by a stronger and fuller pulsation.

f. *Pulsus intricatus*.—One but little developed, and unequally slow.

g. *Pulsus myurus*.—A pulse that gradually becomes smaller and smaller, like a mouse's tail.

h. *Pulsus myurus reciprocus*.—A pulse which, after having become gradually smaller to a certain point, as gradually increases to its fullest size.

The pulses that I have enumerated thus far are curiosities in name and existence. They would be difficult to discover, and have no especial value in diagnosis. The pulses to which I now invite your attention have some value in diagnosis.

i. *Pulsus bigeminus, biferiens, aut bisiliens*.—Traube has called attention particularly to this form of pulse. It is characterized by two short beats, followed by a long pause. Each of the two beats corresponds to a heart contraction, in contradistinction to the dicrotous pulse, in which a double beat corresponds to a single cardiac systole. Traube regards this pulse as one of bad import, and as indicating a fatal termination of the case.

j. *Pulsus alterans*.—A secondary form of the bigeminus. A weak pulsation follows a strong one, and the pause after the weak pulse-beat is longer than that preceding it. This is of bad import.

k. *Pulsus paradoxus*.—An apparently irregular pulse, which becomes smaller or entirely disappears on inspiration. This pulse is met with in exerescent mediastino-pericarditis, and is explained by traction



of the sternum or ribs by bands or growths which compress the aorta. It may also occur in chronic pericarditis, and occasionally also in cases of stenosis of the respiratory tract. In these cases Bamberger explains the change in the pulse rhythm by the varying intra-thoracic pressure, and the amount of blood consequently in the vessels.





